

Cristian Tabares Lopez

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About me

I am a theoretical physicist with interest at the interface between quantum technologies and quantum optics. My research aims to develop novel hybrid quantum optical setups that can be used to improve current quantum computers and simulators. I am broadly interested in understanding complex (quantum) systems to use them as resources to solve technological problems.

Education

MSc in Theoretical Physics

2020-21

Universidad Complutense de Madrid (UCM)

Grade: 9.6/10. First class honours.

Selected coursework: Quantum Information and Computing (10), Quantum Simulation (10), Complex Systems (10-H).

Final dissertation: *Geometric phases in periodically driven systems from a Multiple Scales approach.* Grade: 9.8/10.

BSc in Physics

2016-20

Universidad Autonoma de Madrid (UAM)

Grade: 8.7/10 (ranked 8th out of 96 students).

Selected coursework: Scientific Computing (10-H), Mathematics (10-H), Condensed Matter Physics (10-H).

Final dissertation: *Time dynamics of qubits under pulse sequences.* Grade: 10/10.

Highschool

2010-16

I.E.S. Palas Atenea

Grade: 10/10. Best academic record.

Experience

Researcher

Oct 2021-Present

Instituto de Física Fundamental (CSIC)

I am part of the QUantum Information and Foundations Group ([QUINFOG](#)) at IFF-CSIC. Under the supervision of Alejandro González-Tudela and Diego Porras, I am currently exploring the type of interactions that can be obtained in waveguide QED setups and how to use them as resources to implement quantum algorithms and simulations of complex quantum mechanical systems. We are also interested in generating states of light that can be used as resources for quantum technological applications.

Researcher (Student Research Fellowship)

Jul 2021-Sep 2021

ICFO

I was awarded a [Student Research Fellowship](#) to join the [Theoretical Quantum-Nano Photonics Group](#) at ICFO under the supervision of Darrick Chang. I studied the transport of electromagnetic energy through disordered atomic media and also took part in the regular activities and seminars organized by the group.

Researcher (JAE Intro)

Sep 2020-Jun 2021

ICMM

I was awarded a [JAE Intro Fellowship](#) (a national research award for graduate students) to join the [Novel Platforms and Nano-devices for Quantum Simulation and Computation Group](#) at ICMM-CSIC to explore the manipulation and control of quantum systems using Floquet engineering and non-perturbative techniques. During this time, I also received a [research award](#) for physics students from the Condensed Matter division-GEFES of RSEF). A report summarizing our results was published [here](#).

Student Researcher

Apr 2019-Dec 2019

Department of Theoretical Condensed Matter Physics (UAM)

I was awarded a [research award for physics students](#) to join the department of Theoretical Condensed Matter Physics at UAM under the supervision of Ruben Pérez. We performed simulations using DFT to explain AFM experiments.

Publications

- C. Tabares, A. Muñoz de las Heras, L. Tagliacozzo, D. Porras and A. González-Tudela, *Variational waveguide QED simulators*, arXiv:soon (2023).
- C. Tabares, E. Zohar and A. González-Tudela, *Tunable photon-mediated interactions between spin-1 systems*, Phys. Rev. A **106**, 033705 (2022).

Contributions to conferences

Talks.....

- *Waveguide variational quantum algorithms*. APS March Meeting. Las Vegas (EEUU). March 2023 (accepted).
- *Tunable photon-mediated interactions between spin-1 systems*. XXXVIII Biennial Meeting of the RSEF. Murcia (ES). July 2022.
- *Photon-mediated interactions between spin-1 atoms*. ICE 7. Granada (ES). May 2022.
- *Using atoms and photons for quantum simulations*. IOPTICA Scientific Seminars. Madrid (ES). Dec 2021.

Posters.....

- *Tunable photon-mediated interactions between spin-1 systems*. Cold Atoms Workshop (meeting of the spanish community). Madrid (ES). Nov 2022.
- *Photon-mediated interactions between spin-1 atoms*. Quantum Matter 2022. Barcelona (ES). July 2022.
- *Photon-mediated interactions between spin-1 atoms*. Quenocoba workshop (organized by the group of Ignacio Cirac). Munich (GER). Feb 2022.

Science outreach activities

- *Learning quantum computing with Qiskit blocks*. January 2023, IFF-CSIC, Madrid. We teach quantum computing playing videogames (check [here](#) for more information).
- *Bit vs qubit: differences between classical and quantum computers*. November 2022, Semana de la Ciencia at IFF-CSIC. Madrid. Video [here](#) (in Spanish).
- *Quantum Physics in the school*. May 2022, Colegio Gaudem, Madrid.
- *I want to be a scientist, how could I start?*. April 2022, 4ºESO+empresa at IFF-CSIC. Madrid.
- *What happens when you finish high school?* February 2022, IES Palas Atenea, Madrid.
- *Understanding quantum computers*, November 2021, Colegio Nazaret Oporto, Madrid.
- *Understanding quantum computing*, February 2020, IES Palas Atenea, Madrid.

Other skills

Languages

- Native in Spanish and proficient in English (certified with an overall band of 8.0 at IELTS Academic).

Technical skills ([Github profile](#))

- Advanced programming in Python, Matlab and Mathematica.
- Competent user in C++, Julia and Unix.
- Experience working with scientific computing clusters (using Slurm).
- Experience working with quantum programming (QISKIT and PennyLane) and machine learning libraries (JAX, PyTorch, TensorFlow, Keras).

Complementary education

- *ICFO-Weizmann School on the Frontiers of Light: new approaches to light-matter interactions*, July 2021. 18 hours course.
- *Frontiers in Materials Science II: customized properties for new technologies - Graduate Courses (CSIC)*, March 2021. 32 hours course.
- *AI for Scientists Bootcamp (UAM)*, October 2020. 25 hours course.
- *Introduction to Quantum Computing (UAM)*, October 2019. 60 hours course.